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EFFECTS OF TELEVISION MODELING ON RESIDENTIAL ENERGY CONSERVATION

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A combination of social marketing, communications, social learning (particularly modeling), and behavior analysis may provide an effective framework for behavior change via films and television. We used this approach in developing special television programs about residential energy conservation. The programs were tailored and directed to preselected middle-class homeowners (N = 150), and delivered over a public access channel of a cable TV system. The results indicated that after one program exposure (about 20 minutes), viewers adopted simple strategies modeled in the programs which led to savings of approximately 10% on their home energy use for a substantial part of the cooling and heating season. Although the potential benefits to costs of large-scale media efforts seemed great, institutional barriers for such programs were identified. Less expensive, more local programs seem more viable.

DESCRIPTORS: energy conservation, TV modeling, consumer behavior, behavioral community psychology

During the last 50 years there have been different perspectives on the efficacy of print, radio, and television media as behavior change strategies (McLeod & Reeves, 1981; McQuail & Windabl, 1981). Widely disparate views of media effects have included "hypodermic" or "bullet" models, wherein media were seen as directly influencing passive audiences; "2-step" models suggesting that media influenced "gatekeepers" and "opinion leaders" who, in turn, influenced others through interpersonal processes (e.g., Rogers, 1983); and models that portrayed media effects as weak or nonexistent.

Part of the controversy in the field may be attributed to the lack of: (a) a firm conceptual framework; (b) experimental rigor, and (c) the assessment of key variables (Lau, Kane, Berry, Ware, & Roy, 1980). Ironically, a small body of experimental and social learning-based research does exist on prosocial uses of television programming (Rushton, 1982). That work has yet to figure prominently either conceptually or methodologically in media controversies. Those studies generally showed that programs using specific strategies (e.g., modeling) depicting specific target practices can have immediate and sustained effects (a month) after only one viewing. However, most of the studies were done with children and most of the programs were viewed under special circumstances by single viewers or small audiences. When prosocial media programs for adults have been broadcast in a more usual way to large audiences, effects on even "simple" behaviors (e.g., seat belt use) have been inconsistent (Mielke & Swinehart, 1976; Robertson et al., 1974).

Such apparently inconsistent outcomes may have a common explanation. Over a decade ago, Mendelsohn (1973) indicated that effective media needed to adhere to general guidelines for message development, audience segmentation, and delivery. These guidelines provide a framework for media interventions and include these elements:

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All forms, booklets, and videotapes are available at cost on request. Reprints and other requests should be sent to Richard A. Winett, Department of Psychology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061.

1. Social marketing. Considerable survey and focus group research is used to design a pilot program for a specific audience. The results of the pilot testing are then used for program refinement and more specific audience targeting. This process has characterized the development of commercial programs, but only recently has it been used with prosocial programming (Rice & Paisley, 1981; Solomon, 1982).

2. Social learning. Effective video media uses modeling in message development (Bandura, 1977). Modeling of violent and other antisocial behaviors is prominent in television and partially accounts for its effects on aggressive behavior. However, modeling has infrequently been used in prosocial efforts. Instead, attempts to change beliefs or arouse fear have been used and appear to be ineffective (Leventhal, Safer, & Panagis, 1983).

3. Communications. Auditory and visual variables (e.g., rapid pacing, fade-outs) can be used to sustain initial attention, increase comprehension, and enhance retention (Wright & Huston, 1983). Again, these variables are commonly used in commercial programs, but rarely in prosocial efforts.

4. Behavior analysis. Target behaviors must be explicitly defined and analyses made of supportive contingencies. Target behaviors, positive outcomes, and constraints to performance must be graphically depicted with strategies provided to overcome constraints. However, prosocial efforts have been characterized as having vague messages and goals (Solomon, 1982).

Even when all these guidelines are incorporated into the development and distribution of a program, Mendelsohn (1973) advised seeking modest changes in relatively discrete or simple behaviors. This is consistent with a behavioral perspective where media is construed as an antecedent strategy (Geller, Winett, & Everett, 1982).

This study extends our work on video modeling, residential energy conservation, and human comfort (Winett et al., 1982), and also serves as a test of the guidelines for effective media. Our prior research had demonstrated that one viewing of a video modeling program in a small-group setting, or when viewed at home with project staff and equipment, was effective in reducing the residential electricity use of viewers by about 12% (and 25%–35% on the major program target, heating or cooling). This was shown for both winter and summer seasons (Winett et al., 1982; Winett, Love, & Kidd, 1982; Winett, Love, Stahl, Chinn, & Leckliter, 1983).

A set of low-cost, no-cost strategies (e.g., thermostat changes, use of passive solar, window fans) enabled the consumer to reduce electricity use without reported loss of comfort and (in the summer study) with no change in home temperature or humidity (as measured by hygrothermographs). The strategies partly *substituted* for heating and cooling practices (e.g., constant use of air conditioning) that use more energy and cost more money.

Based on these studies, it appeared that video modeling could possibly be delivered over cable television. If cable TV (or any means to deliver special TV programs to the home) is effective as a behavior change strategy, there can be important cost-benefits. Aside from initial program production costs, the subsequent costs to reach many homes can be minimal.

Thus, our overall objectives included: (a) testing the effectiveness of a program delivered over cable TV on residential energy conservation; (b) partially assessing the efficacy of the social marketing, social learning, communications, and behavior analysis guidelines which formed the framework for the TV program; and (c) further replicating the effectiveness of the substitution strategy.

METHOD

Participants, Setting, and Recruitment

The site of the study was one large subdivison (575 homes) of single, 3–4 bedroom, detached homes in Roanoke, Virginia. About 90% of the homes were subscribers to the local cable TV system. The mean gross annual (1982) income of participants was about $30,000. All participants were homeowners with about 85% having one or more children living at home. Mean age was about

38 years (range, 25–70 years). Homes varied in age (new to 20 years old) and in heating source and appliances, but different systems were randomly distributed across the subdivision.

The recruitment followed door-to-door procedures used previously (Winett et al., 1982), but ended when 175 (30%) homes were recruited (the project's budget limitation). After the recruitment phase, 25 households were dropped that had unconventional heating or cooling systems (e.g., wood stoves, gas air conditioning). This left 150 households that were either all-electric with central air conditioning (45); all-electric with window air conditioning units (12); all-electric with no air conditioning (3); gas heat with electric central air conditioning (59); gas heat with electric central air conditioning units (28); and gas heat with no air conditioning (3).

During a late June to mid-July, 4-week baseline period, homes used a mean of 42.5 kWh (range 15.4 to 80.7) per day (at 5¢ per kWh) for a mean monthly bill of about $70 (range $25 to $133). Thus, the average family budget share allocated to electricity was low (2.8% of gross monthly income), suggesting there would be marginal responsiveness to the subsequent program (Winkler & Winett, 1982).

Experimental Conditions

Prior to baseline, households were randomly divided into "contact" (intensive measurement, 60% of the households) and "noncontact" (minimal measurement, 40%) conditions. After baseline, households were assigned to conditions following a stratified random assignment procedure in which type of household energy system (e.g., gas heat, central air conditioning) was the stratification variable. Five conditions (n = 30 in each) resulted:

No-contact control. Households only had their outdoor electricity meters read, did not complete any forms, and were notified in mid-July that they were in a control condition for an energy conservation study.

Contact control. This condition was the same as the no-contact control group except that weekly forms (related to comfort issues and not reported in detail) were completed by participants, as were pre- and postinformation surveys, and about 65% of these homes had hygrothermographs placed in them to measure temperature and humidity. A data clerk, blind to experimental conditions, delivered and retrieved forms each week on a set schedule and also rewound the hygrothermographs at that time.

No-contact media. Participants were prompted by a letter and a phone call to watch the TV program. They were also called after the program's scheduled showings to ascertain if they had watched, and at what particular time. Each household also received a 10-page booklet described below.

Contact media. This condition was the same as the no-contact media condition except for the addition of the same form completion procedure as the contact-control condition.

Home-contact media. This condition was the same as the contact media condition except that within a week after program viewing, participants were visited in their home by a staff person. The purpose of this 30-minute visit was to explain procedures more fully and determine how they would use the strategies.

The objective of this experimental design was to disaggregate the intervention from the intensive measurement system that entailed frequent personal contact and at the same time to ascertain if such contact and additional face-to-face interaction added to the video program's effectiveness.

Television Program

The program, entitled "Summer Breeze," was about 20 minutes long. Its communication and social learning aspects included: (a) rapid pacing; (b) a well-known theme song of the same name that was related to specific key practices (e.g., using natural ventilation); (c) use of modeling, voice-overs, and captions to emphasize every key point; and (d) repetition of every key practice four times with a summary at the end of the program.

The program was tailored to the target audience. It showed many locations and homes similar to the participants' neighborhood and home. Ac-

tors were the mean age of the viewers and scenes showed economic and life-style patterns that were similar to the target audience. Note also that this type of TV program had been pretested in the prior studies.

The content of the program included: (a) introductory material on reasons to save energy (e.g., save money) despite stable prices; (b) some arguments countering a return to extensive energy use (e.g., it is a waste of money and ultimately harms the environment); (c) a story line involving a somewhat younger couple (mean age = 35 years) dismayed at their high electricity bills, reaching a decision to reduce their energy use, and being instructed via verbal explanations and demonstrations by a somewhat older couple (mean age = 42 years), who are neighbors, how to save energy and retain comfort; and (d) depiction of problems that could occur with the procedures, how to overcome these problems, and specific positive outcomes from the younger couple's efforts (lower electricity bill, but continued comfort). Thus, portions of the content and format were based on modeling and behavior analysis principles. The program's pacing, repetition, organization, and mnemonic devices were based on Wright and Huston's (1983) research on formal features of video media that increase attention, comprehension, and memory.

The strategies shown in the program were: (a) closing all windows, blinds, shades in the morning to trap cool air; (b) not using air conditioning until mid-afternoon, and only if it is very hot outside; (c) placing the thermostat at 78 °F in the evening when it is very warm; (d) turning off the air conditioning at night or placing it at 80 °F; (e) properly using window fans at night; (f) changing the water heater thermostat to 130 °F and insulating the water heater. Viewers also received a 10-page booklet with cartoons depicting strategies. Booklets were either received by mail (no-contact media condition) or hand-delivered (contact media condition) on the day of the first showing.

The program was shown four times (July 12 to July 16, 1982, except Wednesday) and all at 7:00 p.m. (except Thursday at 9:00 p.m.). Participants in the media conditions were asked to watch at least one showing. Participants who were not subscribers to the cable system (n = 11), or who were on vacation that week (n = 11), received a private home showing with project equipment within about a week of the cable TV program.

Verification of Viewing

Viewing of the program was verified in two ways: all participants were telephoned and asked if and when they watched the program; and participants in the media conditions were provided with rating forms prior to the program (by mail or from the data clerk). These 9-item forms required participants to rate aspects of the program (e.g., "enjoyment," "information gained") on a 7-point scale. An open circle was put in the left-hand corner of each form. Toward the end of the TV program, a 30-second scene was inserted. The form was shown and a voice-over was used to ask participants to complete the form and to put an 'X' in the circle so for "scientific purposes" it could be ascertained who watched the program.

Phases of the Study

The study contained the following phases: a 4-week baseline, a 5-week summer intervention period that followed the program, a 4-week summer follow-up phase that started with the discontinuation of the intensive measurement with "contact" homes, a 3-month winter booster phase, and a 1-year follow-up in the next summer (no booster). The winter booster condition exactly followed the no-contact media condition of the summer study described in prior sections. The videotape was an abbreviated (16-minute) version of a winter videotape used in another study (Winett et al., 1983). The winter tape contained a few review scenes from the summer tape to promote continuity.

Dependent Measures

The major dependent measures of the study included electricity and natural gas consumption, an information questionnaire, and a questionnaire on strategies used. Secondary measures included rat-

Table 1
Mean kWh, Overall Percent Reduction, and Percent Reduction for Cooling for Conditions Across Phases

	No-contact control ($n = 30$)	Contact control ($n = 30$)	No-contact media ($n = 28$)	Contact media ($n = 28$)	Home-contact media ($n = 27$)
Baseline kWh	44.2	40.2	48.2	38.7	40.9
Intervention kWh	48.0	42.5	46.5*	37.9	39.7
Overall % reduction	—	—	11.0%	7.4%	8.2%
Est. % reduction for cooling	—	—	28.1%	18.9%	20.9%
Follow-up I kWh	33.6	31.4	30.5**	28.0**	29.3**
% Reduction	—	—	16.7%	7.4%	8.3%
Follow-up II kWh	57.9	52.7	59.3	48.3	51.1
% Reduction	—	—	6.1%	4.6%	4.6%

* = Significant ANCOVAR and Dunnetts test with respective control condition at $p < .05$.
** = Significant ANCOVAR with combined intervention conditions versus combined control conditions at $p < .01$.

ing forms completed every week on perceived comfort and a weekly checklist form used to assess clothing worn (resulting in a clo-value, Rohles, 1981). Home temperature and humidity were derived from the hygrothermographs, which provided continuous measurement.

Electricity meters were read three times per week during the baseline and intervention phases and once per week during the first follow-up, booster, and second follow-up phases. Readings were done by two meter readers who performed one independent overlap of meter readings for 15 homes during the baseline and intervention phase. Agreement between readers was 100%. Gas meters were read once per week and only during the booster phase because gas use is extremely low in this area outside the heating season. The same overlap procedure also yielded 100% agreement. Because no baseline data were available to assess effects during the winter booster, comparison electricity and gas data from the prior year were obtained from the electric and gas companies serving the area. These records were based on monthly meter readings by company personnel and provided monthly total consumption for electricity (kWh) and gas (CCF).

The Information Questionnaire contained 12 items in a multiple-choice format. Questions were keyed to the summer program (e.g., "The most basic aspect of reducing air conditioning involves . . . ?"; "The best position for cooling with a fan for sleeping is . . . ?"). The measure was completed by contact conditions on the first day of baseline (pre-) and immediately after the TV program (post-). Forms were retrieved by the data clerks.

The Strategy Questionnaire, administered during the first follow-up phase, listed the 11 strategies (e.g., closing down the home in the morning, insulating the water heater) shown in the summer program. Participants checked whether they had used this strategy "before" the program or only "after" the program.

The Information and Strategy Questionnaires were not used during the winter booster or 1-year follow-up phases.

RESULTS

First Summer

Inspection of temperature, humidity, comfort, and clo data indicated there were no changes on these measures across baseline and intervention phases. Mean home temperature was 77.5 °F, mean home humidity was 62%, mean comfort rating was 5.5 ("comfortable"), and mean clo was 0.31 (light summer clothing). All media participants reported watching the program. About 80% of the participants marked the 'X' on their form. Across measures, by inspection, there were no differences between the 80% marking their forms and the 20% reporting viewing, but not putting an 'X' on their forms. Therefore, all media participants' data are reported together.

Also, by inspection, there were no differences across measures on homes receiving a private viewing or watching cable TV. These homes were then combined on analyses with main measures. Two control homes reported watching the progam. During the intervention phase, they reduced electricity use by a mean of 7.5%; these homes were excluded from the data.

The basic unit used for electricity use was kWh per day per household. All electricity data were corrected for weather and vacation days following procedures detailed in Winett et al. (1982). Basically, this procedure entails dropping any one reading per household from analyses where a household's mean use per day, divided by its own baseline daily mean, and then divided by the weather correction factor, is less than 0.50. Readings this low generally mean participants were not home for part of the period. However, only about 160 readings of about 4,500 readings (3.6%) during the first summer phases were dropped.

Electricity data were analyzed using covariance analysis (Huck & McClean, 1975) and Dunnetts test (Keppel, 1982) for post hoc comparision. The covariance analysis was used because of the repeated measures design. The Dunnetts test compensates for the increased number of Type I errors due to multiple comparisons by only availing the user contrasts between experimental and control conditions.

Table 1 shows the mean kWh per day per household by condition during the baseline, intervention, and follow-up phases. Percent reduction for a condition was based on dividing the mean daily consumption per condition for either the intervention or follow-up phases by the baseline phase mean, and then dividing this figure by the respective control condition's mean use per phase divided by mean baseline use. Estimated percent reduction for cooling is based on a standard formula that subtracts a constant year-round, mean kWh use (as for lights and appliances) from mean use during a particular phase (described in Winett et al., 1982). Note that the second follow-up phase is also included in the table, even though the winter booster phase occurred between the follow-ups. This is because both follow-ups focused on summer kWh data.

Figure 1 shows mean percent change from baseline and mean kWh use per household by weeks with separate functions for the no-contact and contact conditions. Large differences in kWh use between phases for all conditions were attributable to weather. For example, mean temperatures per phase were: baseline, 76 °F; intervention, 79 °F; follow-up I, 72 °F; and follow-up II, 85 °F. Note, however, that throughout the phases, control conditions closely overlapped.

All three media conditions showed an immediate and similar response to the program during the intervention phase (about a 10% reduction). However, during the first follow-up phase, the no-contact media condition showed about a 17% reduction; during the second follow-up about a 6% reduction was shown. The two contact media conditions, which performed about the same, showed combined mean reductions of about 8% during the first follow-up and about 4.6% during the second follow-up.

During the intervention phase, ANCOVAR indicated a significant difference between the no-contact media condition and its control, $F(1, 55) = 4.34$, $p < .05$. For the contact conditions, differences did not reach significance, $F(2, 83) = 2.93$, $.05 < p < .10$. However, because the analysis approached significance ($p = 0.56$), Dunnetts test was performed. It indicated that both media conditions were significantly different from the control at $p < .05$.

In the no-contact media condition, 21 of 28 homes (75%) reduced electricity used by $\geq 6\%$ compared to 12 of 29 (41%) in the no-contact control condition. For the home-contact media condition, 21 of 28 homes (75%), but only 17 of

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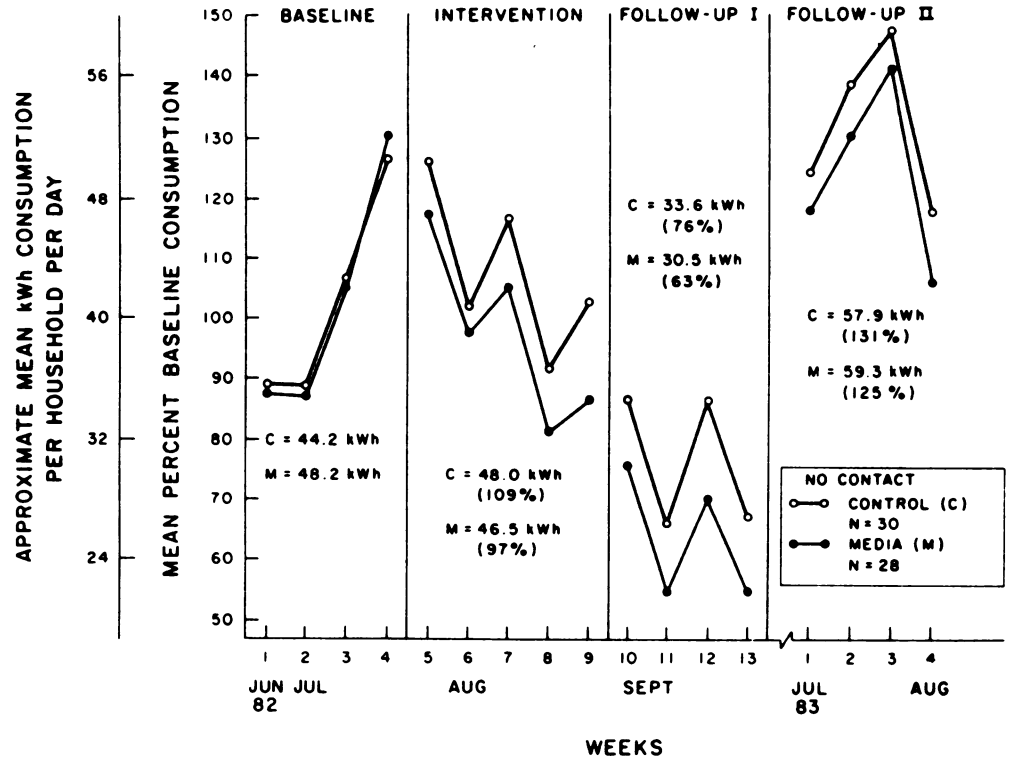
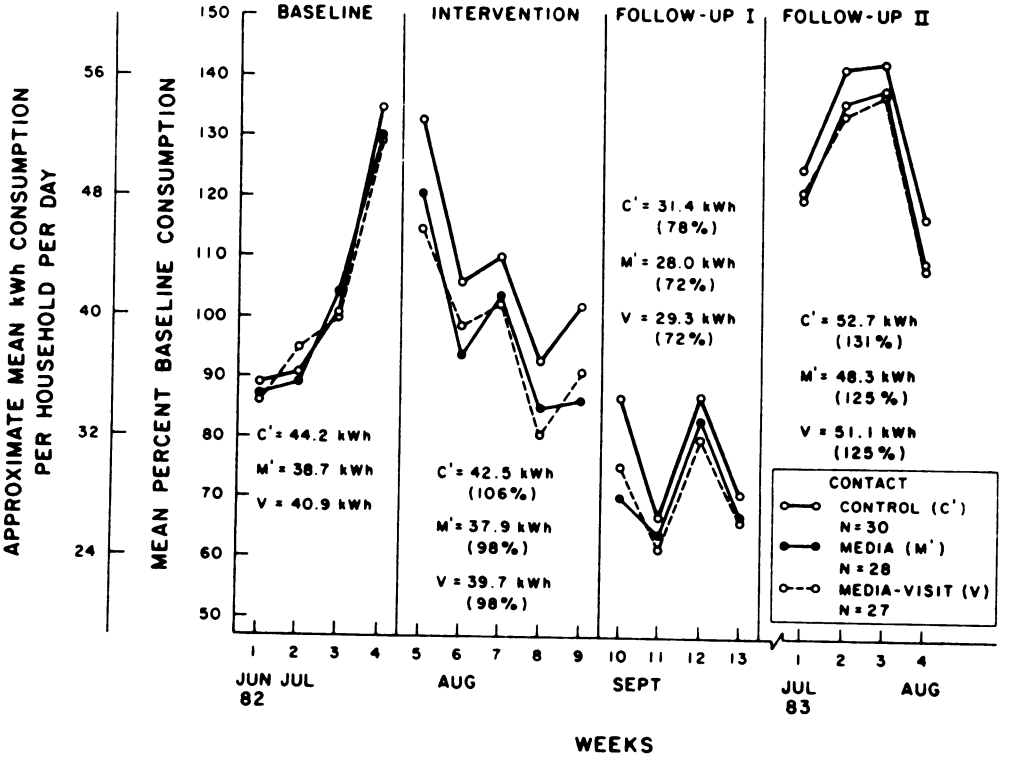
Figure 1. Approximate mean kWh use per household per day and mean percent reduction for no-contact and contact conditions, graphed separately by weeks, across baseline, intervention, and follow-up I and II.


APPROXIMATE MEAN kWh CONSUMPTION PER HOUSEHOLD PER DAY
MEAN PERCENT BASELINE CONSUMPTION
BASELINE
INTERVENTION
FOLLOW-UP I
FOLLOW-UP II
C = 44.2 kWh
M = 48.2 kWh
C = 48.0 kWh (109%)
M = 46.5 kWh (97%)
C = 33.6 kWh (76%)
M = 30.5 kWh (63%)
C = 57.9 kWh (131%)
M = 59.3 kWh (125%)
NO CONTACT
CONTROL (C) N = 30
MEDIA (M) N = 28
JUN JUL 82
AUG
SEPT
JUL 83
AUG
WEEKS


APPROXIMATE MEAN kWh CONSUMPTION PER HOUSEHOLD PER DAY
MEAN PERCENT BASELINE CONSUMPTION
BASELINE
INTERVENTION
FOLLOW-UP I
FOLLOW-UP II
C' = 44.2 kWh
M' = 38.7 kWh
V = 40.9 kWh
C' = 42.5 kWh (106%)
M' = 37.9 kWh (98%)
V = 39.7 kWh (98%)
C' = 31.4 kWh (78%)
M' = 28.0 kWh (72%)
V = 29.3 kWh (72%)
C' = 52.7 kWh (131%)
M' = 48.3 kWh (125%)
V = 51.1 kWh (125%)
CONTACT
CONTROL (C') N = 30
MEDIA (M') N = 28
MEDIA-VISIT (V) N = 27
JUN JUL 82
AUG
SEPT
JUL 83
AUG
WEEKS

27 (63%) in the contact media condition, and 12 of 29 (41%) in the contact control condition reduced use by ≥6%.

The first summer follow-up data were analyzed in the same way as the intervention data. ANCOVAR indicated that the 16.7% reduction by the no-contact media condition was significant, $F(1, 54) = 5.00$, $p < .05$, but the 7.4% and 8.3% reductions of the contact media and home-contact media conditions, respectively, were not significant $F(2, 81) = 1.07$, $p > .05$.

However, because all contact ceased after the intervention phase, the first summer follow-up kWh data were analyzed in a 2-group ANCOVAR, i.e., intervention conditions combined and control conditions combined. Using the same formula as noted previously, the media conditions showed a combined mean reduction during follow-up of about 10.5%, and ANCOVAR showed a significant effect, $F(1, 139) = 9.16$, $p < .01$. Across the media conditions, it was estimated that there was about a 23% savings on kWh used for cooling during the intervention phase and about the same percentage during the first summer follow-up phase (although estimates at that point are less reliable given the low kWh use in the cooler weather).

Follow-Up II

Electricity use in the next summer was compared with the prior year's summer baseline mean and means from weekly meter readings. Readings and analyses focused on four consecutive, very hot weeks from early July to early August when the mean temperature was 85 °F (range 103 °F to 69 °F; the usual mean is 77 °F). From the original prior sample of 145 homes, as of the winter, 17 had changes in household composition and 12 declined to participate, leaving 116 potential homes for follow-up. However, from this total, two more participant households moved, three had installed locked fences, and seven households now had large dogs in the yard. The latter two conditions precluded meter readings. For seven other households, meter readings were consistently very low, indicating that the households were vacant for most of the recording period.

Thus, 97 households remained: 17 of 30 from the no-contact control; 17 of 30 from the contact control condition; 21 of 28 from the no-contact media condition; 22 of 28 from the contact media condition; and 20 of 27 from the home-contact media condition. The sample was potentially biased in that about 57% of the control homes, but 76% of the media homes, were represented. However, all follow-up II condition means were within a mean of 1.5% of prior (full-sample) summer condition means, suggesting that remaining households were representative of the original sample.

Across the 4-week period, control homes averaged a mean of 131% of the prior year's baseline. The no-contact media homes averaged 123% and the contact media conditions both averaged 125%. These differences were consistent across the weeks (see Figure 1), and for the three media conditions represented a mean reduction of 5.1% when the media conditions' kWh use relative to their baseline kWh use was compared to the control conditions' use relative to their baseline. However, a 2-group (media vs. controls) ANCOVAR indicated that this difference was not statistically different, $F(1, 94) = 1.35$, $p > .05$). No other analyses were significant.

Information

ANCOVAR for total correct scores on the 12-item information questionnaire with the three contact conditions showed a significant effect, $F(2, 129) = 6.66$, $p < .01$. For the control, the baseline mean score (5.2, 43%) and intervention mean score (5.4, 45%) were about the same. The two contact media conditions showed increases on this measure, i.e., contact media from 5.3 (44%) to 8.7 (73%), and the home-contact media from 5.4 (45%) to 8.9 (74%). The Dunnetts test showed that both media conditions were significantly different from the control at $p < .01$.

An item-by-item listing of the percent correct scores for the combined media conditions and the contact control is depicted in Table 2. Substantial

Table 2

Pre- and Post- Percent Correct for Contact Media and Contact Control Conditions on Information Questionnaire with Correct Items Indicated as Statement

	Contact media		Contact control	
	Pre-	Post-	Pre-	Post-
1. Cooling is 20% of home energy use	20	37	29	27
2. Behavior is major determinant of energy use*	51	93	50	61
3. Past study showed 40% reduction for cooling*	25	75	27	20
4. Trapping cool morning and night air is basic*	50	94	59	47
5. Turning off air conditioning for periods saves energy*	32	65	37	34
6. Average low temperature here in summer is 66 °F	62	77	51	63
7. Raising thermostat from 75 °F to 78 °F saves 21% on cooling*	17	55	15	19
8. Fans use 16% energy of air conditioning*	49	83	44	43
9. Spot cooling or flow-through positions can be used with fans for sleeping	66	83	72	70
10. Most people can be comfortable at 78 °F	60	76	62	68
11. 130 °F is an adequate setting for water heaters*	57	99	61	54
12. Heating water accounts for 15% of home energy use	35	45	25	34

* (Media condition, post-pre) − (control condition, post-pre) > 30%.

changes (>30% more gain than control) in information were for items noted on Table 2 with an asterisk. These were considered "key" items. Correlational analyses failed to find any significant relationships between change in baseline to intervention total information score and energy savings (percent or actual kWh). There were also no significant relationships found between change scores on key items only and energy savings, or between individual key items and energy savings.

Strategies Reportedly Adopted by Viewers

Questionnaires were completed by 74 of 83 (89%) households. If a household checked a strategy as only used after the TV program, it was considered a "new adoption" of a strategy. Closing the house down in the morning was newly adopted by 22 households (29.8%); opening the house at night by 34 households (46.0%); using natural ventilation by 30 households (40.5%); using fans by 25 households (33.8%); turning the air conditioning off in the morning by 18 households (24.3%); using air conditioning in the afternoon only if it is very hot and setting it at 78 °F, by 26 households (35.1%); setting the air conditioning thermostat at 78 °F in the evening by 19 households (25.7%); turning the air conditioning off or to 82 °F when gone for 2 or more hours by 23 households (29.7%); turning the air conditioning off at night or 82 °F before sleep by 33 households (44.6%); setting the water heater at 130 °F by 15 households (20.3%); and insulating the water heater by 6 households (8.1%).

An algorithm for "strategies newly adopted" was generated by assigning each home a score of 2 points for a change in air conditioning use and a score of 1 point for any other change reported. This "strategies adopted score" correlated, $r(80) = 0.47$ ($p < .001$), with a percent electricity saved score. This weaker than usual relationship (see Winett et al., 1982) may be attributable to the wide variety of homes and heating/cooling systems.

Program Ratings

Participants in the three media conditions rated the program at a mean of 5.7 (condition range 5.5 to 5.8) across items indicating a positive evaluation from initial viewing.

Winter Booster Evaluation

Several practical difficulties precluded a clear-cut evaluation of the winter TV program: (a) in-

appropriate scheduling of the program so that showings conflicted with holiday shopping and parties; (b) changes in household composition and heating systems since the prior winter; (c) only a best-guess estimate on furnace efficiency used for estimating actual energy used for heating in gas-heated homes; and (d) availability of only monthly nonweather-corrected utility records from the prior winter to compare with project originated readings for the intervention winter. In addition, although the videotape was found effective in a prior winter study (Winett et al., 1983), and evaluated positively by participants in that study, television production professionals judged it to be of poorer quality than the summer program.

A descriptive analysis with 65 households (media = 36; control = 29) with the same household composition and heating system as the prior year and available utility records from the prior year, suggested that there were initial reductions in energy use comparable to the first summer. However, reductions did not appear to be as well maintained as those in the summer.

DISCUSSION

The clearest outcomes in this study were for the first summer. One viewing of the 20-minute TV program resulted in the adoption of some simple, no-cost strategies that yielded overall electricity savings across conditions of close to 10%, with no reported loss in comfort, and about a 23% savings on electricity used for cooling. These results provide evidence to support the "substitution strategy." Reductions in electricity use were consistently observed for 9 weeks after program viewing, i.e., until the end of the summer. The study's design suggested that exposure to the program, and not personal contact or the intensive measurement system, was the efficacious element.

The findings for the winter booster TV program were less clear-cut because of several practical and methodological problems. However, there was some evidence of initial energy reductions after program viewing. The second summer follow-up, which had minimal methodological problems, did not show evidence for long-term maintenance.

Overall, these findings and those of prior studies (Winett et al., 1982, 1983) indicate that video modeling is effective for the duration of an *initial* cooling or heating season. Longer term maintenance has yet to be adequately demonstrated. However, it may also be that the participants' low-budget share for energy moderated the effectiveness of the media intervention. Studies that focus on long-term maintenance and that include blocks of participants with different budget share levels are needed.

The study is generally supportive of the framework outlined in the introduction. The program's format and formal features were based on considerable prior research; the program was targeted to a specific audience segment; the program's format was designed to enhance attention and memory; extensive modeling was used; conservation practices were explicitly shown; and there were some incentives (albeit not large) for behavior change. However, functional relationships between aspects of the framework and outcome measures were not demonstrated. Such analyses appear needed, as do applications of the framework to more complex behaviors.

The approach may also be of value in the general area of consumer behavior (Winett & Kagel, 1984; Wright, 1979). Information is often provided to consumers by government and other third-party sources to remedy "market imbalances." There is agreement that such information remedies are often poorly designed and delivered, and that a different approach using modern communication systems is needed (Beales, Mazis, Salop, & Staelin, 1981; Mazis, Staelin, Beales, & Salop, 1981).

Although our study was designed as a small-scale demonstration, data based on the program's production costs and the study's results suggest a promising cost-benefit ratio if this approach were used on a large scale. The commercial costs of a program similar to "Summer Breeze" can be as high as $40,000. This is because the program had about 20 locations and many short scenes that required extensive time to set up and later edit into a coherent program. For example, over 200 hours of editing time were required. It also cost about $1 per home to encourage viewing via phone

and written prompts. However, an advantage of the TV program approach is that costs to show the program again to a much wider audience are minimal, except for $1 per home. Thus, this antecedent strategy is not seen as potent on an individual basis, but potent in terms of producing modest effects magnified by many viewers.

Based on the costs noted, and mean savings per household achieved in the study ($14 for the 9 weeks following the program), 1 million households can be reached for slightly more than $1 million at a savings of $14 million. The same costs can yield greater savings in the winter when energy use and consumer costs are several fold higher.

However, it is not likely American TV networks and cable systems will readily embrace and air this or similar programs. The current economic dictates of American TV make its major mission entertainment, so that viewers will continue to watch certain TV programs, and therefore, see certain commercials. Corporations pay networks and cable systems to air commercials so that consumers will buy more of their products. In our study, viewers were urged to consume less energy, and hence, buy less. In this analysis, the fact that viewers liked the program and profited from it does translate to large-scale broadcasting appeal. More optimistically, there seem to be other practices (e.g., specific healthy food purchases) that may be the subject of programs that can benefit both consumers and corporations (Mazis et al., 1981).

Inexpensive alternatives to our TV programs could be developed. Effective elements of this approach (most likely attention devices, modeling, behavioral analysis, and appropriate targeting to an audience) may be retained in inexpensive (studio production) video-media. Such programs can be shown over public access channels of cable systems to selected audiences in local communities with potentially positive outcomes at minimal costs.

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